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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/587,881	08/01/2006	Yasushi Yagi	2006_1186A	3846

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EXAMINER

SMITH, PHILIP ROBERT

ART UNIT	PAPER NUMBER
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3739

NOTIFICATION DATE	DELIVERY MODE
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05/20/2010

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No. 10/587,881	Applicant(s) YAGI ET AL.	
	Examiner PHILIP R. SMITH	Art Unit 3739	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 March 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) 2-8, 10-13 and 18 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 9 and 14-17 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01 August 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>8/1/06</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election

- [01] Claims 2-8,10-13,18 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected species, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on 3/1/10.
- [02] Applicant traverses because the application is a national stage application and because the claims satisfy the requirement of unity of invention. Applicant cites MPEP § 1850(II), which states that “[u]nity of invention has to be considered in the first place only in relation to the independent claims in an international application and not the dependent claims.” Consequently, “[i]f the independent claims avoid the prior art and satisfy the requirement of unity of invention, no problem of lack of unity arises in respect of any claims that depend on the independent claims.”
- [03] However, the cited portions of MPEP § 1850(II) are addressed to claims depending on “independent claims *that avoid the prior art*” (emphasis added). Claim 1 does not avoid the prior art (see below).
- [04] MPEP § 1850(II) further states that “If, however, an independent claim does not avoid the prior art, then the question whether there is still an inventive link between all the claims dependent on that claim needs to be carefully considered. If there is no link remaining, an objection of lack of unity a posteriori (that is, arising only after assessment of the prior art) may be raised. Similar considerations apply in the case of a genus/species or combination/subcombination situation.”
- [05] The species identified in the election requirement (1/27/10) share the technical features recited in claim 1. As will be shown below, the technical feature of claim 1 is not a “special technical feature”

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as it does not make a contribution over the prior art. The requirement is still deemed proper and is therefore made FINAL.

Specification

[06] The disclosure is objected to because of the following informalities:

[06a] Paragraph [0132] refers to “the above-described [sic] energy minimization problem”.

[06b] Starting with paragraph [0100] on page 29 of the specification, the equations are misnumbered. Paragraph [0100] refers to “the following equation (12)”. What follows is labeled as “Expression 10”. There is no issue with the specification alternatively referring to “equations” versus “expressions”. However, the numbers do require correction. The following are mislabeled:

- “Expression 10” should be changed to “Expression 12” on page 29.
- 11 should be 13 , 12 should be 14 on page 31.
- 13 should be 15 on page 34.
- 14 should be 16, 15 should be 17 on page 36.
- 16 should be 18, 17 should be 19 on page 37.

[06c] Appropriate correction is required.

Claim Rejections - 35 USC § 112, Paragraph One

[07] The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

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- [08] Claim 16 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.
- [09] Claim 16 recites “an omnidirectional camera”. Applicant elected an embodiment wherein the camera is “mounted on a tip of a probe”. Figures 1 and 2 show a probe-type endoscope having a camera labeled “32”. According to the specification ([0094]), this camera “32” is “an omnidirectional camera”. However, Figures 1 and 2 simply do not support the assertion that the camera “32” is omnidirectional.
- [10] Figure 3 shows a detail of the “omnidirectional camera 32” comprising a “hyperboloidal mirror 42”. But the detail of “32” can not be reconciled with the probe-type endoscope of Figures 1 and 2. According to the detail, the mirror “42” reflects light from the sides toward a sensor in the middle. According to Figures 1 and 2, the “omnidirectional camera 32” does not receive light from the sides but from the front.

Claim Rejections - 35 U.S.C. 112, Paragraph Two

- [11] The following is a quotation of the second paragraph of 35 U.S.C. 112:
- The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
- [12] Claims 9,14-16 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

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[13] Claim 9 recites a panoramic image generation unit “operable to define predetermined energy.” It is not clear what “predetermined energy” refers to. Moreover, it is not clear what exactly the panoramic image generation unit is capable of defining if that something is “predetermined”. There is also an antecedent basis problem since later claims refer back to “the predetermined energy”.

[13a] For the purposes of applying the prior art, this portion of claim 9 will be interpreted as “operable to define ~~predetermined~~ an energy”. The referential portion of claim 14 will be interpreted as “the ~~predetermined~~ energy”.

[14] Claims 14-15 incorporate claim 9, and are rejected on that basis.

[15] Claim 16 recites “a panoramic image having a fixed visual angle with respect to a direction perpendicular to a traveling direction of said omnidirectional camera”. It is not clear what a “panoramic image having a fixed visual angle” is. It is clear from the disclosure that the omnidirectional camera has a traveling direction, and it is understood that any number of lines could be imagined that are perpendicular to that direction. But it is not clear what “a fixed visual angle with respect to” this set of perpendicular lines would be. Nor is it clear what property of the panoramic image is affected by this “fixed visual angle”.

Claim Rejections - 35 USC § 103

[16] The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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[17] Claims 1,9,14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gombrich (6,081,740) in view of Heung-Yeung Shum and R. Szeliski, "Construction and Refinement of Panoramic Mosaics with Global and Local Alignment," *Proc. Int'l Conf. Computer Vision*, pp. 953-958, 1998.

[18] With regard to claim 1:

[18a] Gombrich discloses an endoscope system ("endoscope 30") for taking images of an inside of an object, comprising:

- a camera ("imaging detectors 45" 4/17) operable to take images of the inside of the object in a living body, which is capable of motion; and
- an image generation unit ("computing device 110" 5/13) operable to generate a panoramic image of the inside of the object by performing a video mosaicking process ("joining multiple contiguous fields of view to produce a panoramic display" 5/22-23) intended for pasting images.

[18b] Gombrich does not disclose a motion correction process, or an image modification process through energy minimization on the plurality of images obtained by said camera.

[18c] Heung-Yeung (hereafter "HY") discloses a motion correction process ("motion estimate" p957), and an image modification process through energy minimization on the plurality of images obtained by said camera ("minimize the difference between screen coordinates of all overlapping pairs of images" p955), said processes being intended for estimating camera motion ("camera translation" p957), correcting previously definable motion in the living body and correcting previously indefinable internal deformation in the living body ("moving objects") p957.

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- [18d] At the time of the invention, it would have been obvious to a person of ordinary skill in the art to provide motion correction and image modification through energy minimization on the images captured by Gombrich's device. A skilled artisan would be motivated to do so in order to generate a panoramic image that is free from misregistrations caused by camera translation or moving objects, as taught by HY.
- [19] With regard to claim 9: the image generation unit disclosed by Gombrich in view of HY comprises:
- [19a] a feature region cutout unit operable to cut out a plurality of feature regions ("use the patch centers as prospective "feature" points" p955) having a predetermined size ("e.g., 16 x 16 pixels" p955) from each of the plurality of images obtained by said camera; and
- [19b] a panoramic image generation unit operable to define an energy based on the plurality of feature regions included in each of the plurality of images, associate the plurality of feature regions between the plurality of images such that the energy is minimized, and generate a panoramic image of the inside of the object based on the association result ("minimize the difference between the ray directions of corresponding points using a rotational panoramic representation with unknown focal length" p955).
- [20] With regard to claim 14: the predetermined energy is determined based on a degree of deviation between a plurality of control points selected from a first image taken by said camera and a plurality of control points, in a second image taken by said camera, which respectively correspond to the plurality of control points selected from the first image ("corresponding points between pairs of images are automatically obtained using patch-based alignment" p955).

Additional Claim Rejections - 35 USC § 103

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- [21] Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gombrich (6,081,740) in view of Heung-Yeung Shum, and in further view of Belson (2005/0165276).
- [22] As noted above, Gombrich in view of HY discloses a camera in a probe that is to be inserted into a digestive organ.
- [23] Gombrich in view of HY does not disclose that the camera is in the tip of the probe.
- [24] Belson discloses a "CCD or CMOS camera, positioned at the distal end 108 of the endoscope body 102" ([0027]).
- [25] At the time of the invention, it would have been obvious to a person of ordinary skill in the art to provide a camera at the distal tip of the probe-type endoscope disclosed by Gombrich. A skilled artisan would be motivated to do so in order to obviate the image relay elements disclosed by Gombrich.

Allowable Subject Matter

- [26] Claims 15-16 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

Conclusion

- [27] The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.
- [28] Akizuki (2007/0073103), Gilad (2006/0217593), Wallace (2006/0106283), Iddan (2004/0249247) disclose combining multiple ring-shaped images into a long cylindrical image. Glukhovsky (2003/0120130) discloses an algorithm that combines forward-looking images and backward-looking images based on pattern matching. Hale (2004/0210105) relies on accurate measurement

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of the camera position and direction. None of these methods includes an "energy minimization" technique. Arai (2003/0191369) shows an omnidirectional endoscope.

[29] Any inquiry concerning this communication or earlier communications from the examiner should be directed to Philip R Smith whose telephone number is (571) 272 6087 and whose email address is philip.smith@uspto.gov. The examiner can normally be reached between 9:00am and 5:00pm.

[30] If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Linda Dvorak can be reached on (571) 272 4764.

[31] Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Philip R Smith/
Examiner, Art Unit 3739